

Program of Bioinformatics for International Students (2019)

I. Introduction

Life science has been central to the development of the 21st century natural sciences, and its development is related to people's health and well-being. Today, life and health industry has become a new driving force to promote the development of the world economy. Therefore, the central and local governments set the strategic priorities to foster advancing emerging life science related industries.

Life science is one of the key disciplines of the Southern University of Science and Technology (SUSTech). Founded in 2012, the Department of Biology is among the first established academic departments in the university. Since its founding, the Department has assembled groups of faculty members with diverse research interests and expertise to tackle fundamental problems of life science. All of the faculty members had prior research experience at top internationally-acclaimed universities before joining SUSTech and some of them had been awarded tenures in these universities or research institutions worldwide.

The faculty of the department are supported by the state-of-the-art scientific research platform facilities and talent recruitment programs, such as the Guangdong Provincial Key Laboratory, Guangdong Provincial "Pearl River Talent Program" for Innovation and Entrepreneurship, Cryo-EM Center, Plant and Food Research Institute, Neuroscience Research Institute and Experimental Animal Center. Concentrated on five major areas, namely molecular cell biology, neurobiology, plant biology, system biology and structural biology, their research focuses on the frontiers of life science and high-impact human health issues, with cross-disciplinary approaches.

The life science was approved to be the Guangdong Provincial key discipline in 2016. In 2018, the Department was authorized to confer doctoral and master degrees, which sets the department on track to be developed with top-tier priority in Guangdong Province.

On this basis, we set up a special major in Bioinformatics to meet the urgent needs of the society for talents in this field. With the strength of its excellent basis and faculty in bioinformatics research, the Department of Biology is committed to cultivating excellent comprehensive and innovative talents with strong biological information research and practical abilities.

II. Objectives and Learning Outcomes

(I) Objectives

It aims to cultivate high-level comprehensive and innovative talents with complete moral, intellectual and physical development, who master the basic knowledge of biological science, systematically master the basic theory, knowledge and skills of computer science and biological information, and have strong practical and research ability in the acquisition, processing, development and utilization of biological information. We focus on developing students' creative ability, independent thinking and scientific research capabilities, so that students will become

scientists in the field of bioinformatics in the future, or core technology developers in enterprises.

(II) Requirements

1. Mastering the basic theoretical knowledge of mathematics, physics and life science.
2. Mastering the basic theories, knowledge and skills of computer science and biological information; understanding the frontiers and latest developments in bioinformatics.
3. Having the ability to independently design experiments, conduct experiments, collect and analyze experimental results, and write reports; having internationalized version with the ability to write, communicate and present scientific results in English.

III. Study Length and Graduation Requirements

Study length: 4 years

Degree conferred: Bachelor of Science

The minimum credit requirement for graduation: 138 credits (not including English courses);

Category	Module	Minimum Credit Requirement
General Education (GE) Required Courses (50 credits)	Science	30
	Physical Education	4
	Chinese Languages & Culture	16
General Education (GE) Elective Courses (15 credits)	Humanities	4
	Social Sciences	4
	Arts	2
	Science	5
Major Course (73 credits)	Major Foundational Courses	20
	Major Core Courses	20
	Major Elective Courses	23
	Research Projects, Internship and Undergraduate Thesis /Projects	10
Total (not including English courses)		138

IV. Discipline

Bioinformatics

V. Main Courses

For details please refer to General Education Required Courses, Major Required Courses (Table 1), Major Elective Courses (Table 2).

VI. Practice-Based Courses

See Table 3.

VII. Pre-requisites for Major Declaration

Major Declaration Time	Course Code	Course Name	Prerequisite
Declare major at the end of First Year	MA101B	Calculus I A	
	MA102B	Calculus II A	MA101B
	CH101A	General Chemistry A	
	BIO103	Principles of Biology	
	BIO104	General Biology Laboratory	BIO102B or BIO103 or MED101
Declare major at the end of Second Year	MA107B	Linear Algebra B	
	PHY103B	General Physics B (I)	
	PHY105B	General Physics B (II)	PHY101B
	CS102B	Introduction to Computer Programming B	
	BIO201	Biochemistry (Macromolecules)	BIO103, CH101A
	BIO203	Microbiology	
	BIO320	Molecular Biology	
Note: Students need to complete all the courses above (include the pre-requisites for Major Declaration at the end of First Year) when they declare major at the end of Second Year.			

VIII. Requirements for GE Required Courses

(I) Science Module

Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	Language Instruction	Prerequisite	Dept
MA101B	Calculus I A	4		4	Spr/Fall	B/E	NA	MATH
MA102B	Calculus II A	4		4	Spr/Fall	B/E	MA101B	MATH
MA107B	Linear Algebra B	4		4	Spr/Fall	B/E	NA	MATH
PHY103B	General Physics B (I)	4		4	Spr/Fall	B/E	NA	PHY
PHY105B	General Physics B (II)	4		4	Spr/Fall	B/E	PHY101B	PHY
CH101A	General Chemistry A	4		4	Spr/Fall	B/E	NA	CHEM
CS102B	Introduction to Computer Programming B	3	1	4	Spr/Fall	B/E	NA	CSE
BIO103	Principles of Biology	3		3	Spr/Fall	B/E	NA	BIO
Total		30	1					

(II) Physical Education

Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	Language Instruction	Prerequisite	Dept
GE131	Physical Education I	1		2	1/Fall	C	NA	PE Center
GE132	Physical Education II	1		2	1/Spr	C	NA	
GE231	Physical Education III	1		2	2/Fall	C	NA	
GE232	Physical Education IV	1		2	2/Spr	C	NA	
Total		4		8				

(III) Chinese Languages & Culture

Course Code	Course Name	Credit	Hours/week	Term	Language Instruction	Prerequisite	Dept
CLE008	Elementary Chinese I	2	4	1/Fall	B	NA	CLE
CLE009	Elementary Chinese II	2	4	1/Spr	B	CLE008	
CLE027	Intermediate Chinese I	2	4	2/Fall	B	CLE009	
CLE028	Intermediate Chinese II	2	4	2/Spr	B	CLE027	
CLE031	Advanced Chinese I	2	4	3/Fall	B	CLE028	
CLE032	Advanced Chinese II	2	4	3/Spr	B	CLE031	

CLE033	Chinese Culture	2	2	Spr/Fall	B/E	NA	CLE/ HUM/ SSC
CLE034	Chinese History	2	2	Spr/Fall	B/E	NA	
Total		16	28				

(IV) English Language

All students are required to undertake the English Placement Test before selecting courses, based on which students will be assigned to 3 levels to be ready for the courses with English as the instruction language.

SUSTech English III, English for Academic Purposes are required for Level A.

SUTech English II, SUSTech English III, English for Academic Purposes for Level B.

SUSTech English I, SUSTech English II, SUSTech English III, English for Academic for Level C.

Course Code	Course Name	Credit	Hours/week	Instruction Language	Prerequisite	Dept
CLE021	SUSTech English I	4	4	E	NA	CLE
CLE022	SUSTech English II	4	4	E	CLE021	
CLE023	SUSTech English III	4	4	E	CLE022	
CLE030	English for Academic Purposes	2	2	E	CLE023	

IX Requirements for GE Elective Courses

(I) Students are required to complete 4 credits for the Humanities Module and Social Sciences Module respectively, and 2 credits for the Music and Art Module. (Information about the available courses and the instruction language will be announced before the course selection session)

(II) Students are required to complete 5 credits for Science Module.

Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	Language Instruction	Prerequisite	Dept
CS101A	Introduction to Computer Science A	2		2	Fall		NA	CSE
PHY104	Experiment of Fundamental Physics	2	2	4	Spr/Fall	B/E	NA	BIO
MA108	Program Design and Database	3	1	4	Spr			MATH
BMEB131	Introduction to Biomedical Engineering	2		2	Spr		NA	BME
ESE313	Introduction to Ecology	3		3	Fall		NA	ESE
CH313	Chemical Biology	3		3	Fall			CHEM
Total		15	3					

X. Major Course Arrangement

Table 1: Major Required Course (Foundational and Core Courses)

Course Category	Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	take the course Advised term to	Instruction language	Prerequisite	Dept.	
Major Foundational Courses	BIO104	General Biology Laboratory	2	2	4	Spr/Fall	1/Spr/Fall	B/E	BIO102B or BIO103 or MED101	BIO	
	BIO201	Biochemistry (Macromolecules)	3		3	Spr/Fall	2/Fall	B/E	BIO103 CH101A	BIO	
	BIO320	Molecular Biology	3		3	Spr/Fall	2/Fall	B/E	BIO103	BIO	
	CS203B	Data Structures and Algorithm Analysis B	3	1	4	Fall	2/Fall	B/E	CS102A	CSE	
	BIO202	Biochemistry II (Metabolism)	3		3	Spr/Fall	2/Spr	B/E	BIO201	BIO	
	MA212	Probability and Statistics	3		3	Spr/Fall	2/Spr	B/E	MA102a MA102B	MATH	
	BIO210	Biostatistics	3		3	Spr/Fall	2/Spr	E	BIO103	BIO	
	Total			20	3						
Major Core Courses	BIO301	Genetics	3		3	Spr/Fall	2/Spr	B/E		BIO	
	BIO 206-15	Cell Biology	4		4	Spr/Fall	3/Fall	B/E	BIO103	BIO	
	BIO309	Computational Biology	3	1	4	Fall	3/Fall	B		BIO	
	CS303B	Artificial Intelligence B	3	1	4	Fall	3/Fall	E	MA212 CS203	CSE	
	BIO304	Systems Biology	3		3	Spr/Fall	3/Fal	B	Dept. BIO: BIO206-15, MA212 Dept. MATH: BIO103, MA212, MA206 Dept. BME: BIO103, MA212, BMEB311 Dept. PHY: BIO103, MA212, PHY203-15	BIO	
	BIO306	Bioinformatics	4	2	6	Spr	3/Spr	B	BIO309	BIO	
	Total			20	4						
		BIO480A 17	Projects of Science and Technology Innovation I	2	2	4	Fall/Spr/Smr	1/Smr	B/E		BIO
	BIO490	Thesis	8	8	16	Spr	4/Spr	B/E		BIO	

	Total	10	10						
Projects of Science and Technology Innovation accept students to start their laboratory training from the 2nd to the 10th semesters.									

Table 2: Major Elective Courses

Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	take the course Advised term to	Instruction language	Prerequisite	Dept.
MA201b	Ordinary Differential Equations B	4		4	Spr/Fall	2/Fall	B	MA102B	MATH
MA206	Mathematical Modelling	3		3	Spr	2/Spr	B	MA203a or MA213	MATH
MA305	Numerical Analysis	3		3	Fall	3/Fall	B	MA203a or MA213	MATH
MA333	Introduction to Big Data Science	3		3	Fall	3/Fall	B	MA212	MATH
BIO211	Basic Synthetic Biology and Laboratory	2	1	3	Smr	1/Smr	B	BIO103	BIO
BIO207-15	Plant Physiology	3		3	Fall	2/Fall	B	BIO103	BIO
BIO203	Microbiology	3		3	Fall	2/Fall	B/E		BIO
BIO205	Microbiology Laboratory	2	2	4	Fall	2/Fall	B/E	BIO104; BIO203 or ESE301	BIO
BIO222	Biochemistry and Molecular Biology Laboratory	2	2	4	Spr	2/Spr	B/E	BIO104 BIO201 BIO320	BIO
BIO308	Frontier in Life Sciences Seminar and Journal Club	2		2	Spr	2/Spr	B		BIO
BIO303	Genetics Laboratory	2	2	4	Spr	2/Spr	B/E	BIO104 BIO301	BIO
BIO208	Cell Biology Laboratory	2	2	4	Fall	3/Fall	B/E	BIO104 BIO206-15	BIO
BIO311-14	Animal Physiology	3		3	Fall	3/Fall	B/E		BIO
BIO305	Model Organism and Developmental Biology	3		3	Spr	3/Spr	B	BIO103	BIO
BIO401-16	Genetic Engineering	3		3	Fall	3/Fall	B/E	BIO320	BIO
BIO323	Advanced Cell Biology	2		2	Spr	3/Spr	B	BIO206-15	BIO
BIO310	Neurobiology	3		3	Spr/Fall	3/Spr	B/E	BIO201	BIO
BIO331	Protein Structure and Function	3	1	4	Spr	3/Spr	B	BIO201	BIO
BIO332	Stem Cell and Regenerative Medicine	2		2	Spr	3/Spr	B	BIO206-15	BIO
BIO340	Protein Engineering	3		3	Spr	3/Spr	E	BIO103 or BIO102B	BIO
BIO302	Modern Biotechnology	3		3	Spr	3/Spr	B	BIO201 BIO206-15	BIO
BIO344	Modern Biotechnology Laboratory	2	2	4	Spr	3/Spr	B	BIO208	BIO
BIO348	Scientific Writing and Communication	1		1	Spr	3/Spr	B		BIO
BIO411-16	Dynamical Systems Simulation in Biology	3		3	Fall	4/Fall	B/E	BIO103 MA101B MA107B	BIO
BIO405	Immunology	3		3	Fall	4/Fall	E	BIO206-15	BIO
BIO480B17	Projects of Science and Technology Innovation II	2	2	4	Fall/Spr/Smr		B/E	BIO480A17	BIO

BIO480C1 7	Projects of Science and Technology Innovation III	2	2	4	Fall/Spr/ Smr		B/E	BIO480B17	BIO
Total		69	16	85					
Note: A minimum of 23 credits (include at least 2 lab credits) MUST be taken to fulfill Major Requirements.									

Table 3: Overview of Practice-Based Courses

Course Code	Course Name	Credit	Lab Credits	Hours/week	Spr	take the course Advised term to	Instruction language	Prerequisite	Dept.
CS102B	Introduction to Computer Programming B	3	1	4	Spr /Fall	1/Fall	B/E	NA	CSE
PHY104	Experiment of Fundamental Physics	2	2	4	Spr/ Fall	1/Spr	B/E	NA	PHY
MA108	Program Design and Database	3	1	4	Spr	1/Spr	C	NA	MATH
BIO104	General Biology Laboratory	2	2	4	Spr /Fall	1/Spr/ Fall	B/E	BIO102B or BIO103 or MED101	BIO
BIO211	Basic Synthetic Biology and Laboratory	2	1	3	Smr	1/Smr	B	BIO103	BIO
CS203B	Data Structures and Algorithm Analysis B	3	1	4	Fall	2/Fall	B/E	CS102A	CSE
BIO205	Microbiology Laboratory	2	2	4	Fall	2/Fall	B/E	BIO104; BIO203 or ESE301	BIO
BIO222	Biochemistry and Molecular Biology Laboratory	2	2	4	Spr	2/Spr	B/E	BIO104 BIO201 BIO320	BIO
BIO303	Genetics Laboratory	2	2	4	Spr	2/Spr	B/E	BIO104 BIO301	BIO
BIO309	Computational Biology	3	1	4	Fall	3/Fall	B		BIO
CS303B	Artificial Intelligence B	3	1	4	Fall	3/Fall	E	MA212 CS203	CSE
BIO208	Cell Biology Laboratory	2	2	4	Fall	3/Fall	B/E	BIO104 BIO206-15	BIO
BIO306	Bioinformatics	4	2	6	Spr	3/Sp	B	BIO309	BIO
BIO331	Protein Structure and Function	3	1	4	Spr	3/Spr	B	BIO201	BIO
BIO344	Modern Biotechnology Laboratory	2	2	4	Spr	3/Sp	B	BIO208	BIO
BIO480A 17	Projects of Science and Technology Innovation I	2	2	4	Fall/ Spr/ Smr	1/Smr	B/E		BIO
BIO480B 17	Projects of Science and Technology Innovation II	2	2	4	Fall/Sp r/Smr		B/E	BIO480A17	BIO
BIO480C 17	Projects of Science and Technology Innovation III	2	2	4	Fall/ Spr/ Smr		B/E	BIO480B17	BIO
BIO490	Thesis	8	8	16	Spr	4/Spr	B/E		BIO
Total		52	37	89					

Table 4: Overview of Course Hours and Credits

Course Category	Total Course Hours	Total Credits	Credit Requirements	Percentage of the Total*
General Education (GE) Required Courses (not including English courses)	1008	50	50	36.2%
General Education (GE) Elective Courses			15	10.9%
Major Foundational Courses	368	20	20	14.5%
Major Core Courses	384	20	20	14.5%
Major Elective Courses	1360	69	23	16.7%
Research Projects, Internship and Undergraduate Thesis/Projects	320	10	10	7.2%
Total (not including English courses)	3440	169	138	100%

* Percentage of the total= Credit requirements of each line / Total credit requirements

Curriculum Structure of Bioinformatics



